Field Perspective:
North Central River Forecast Center
WSR-88D Data Usage
MPE

Presented for NEXRAD Technical Advisory Committee Meeting November 19-20, 2001

Holly Reckel Hydrometeorologic Analysis and Support Forecaster

Precipitation Data for NWSRFS

- NCRFC routinely uses Computed MAP.
- We use MPE MAPX on case by case basis.
 - MAPX is used in river model if HAS/hydrologist determines MAPX to be better estimate, mainly during convective events, for better spatial and time distribution.
- Then after reprocessing/QC with MPE the MAPX might be used as the better estimate for river model.
- Rarely is MPE the better estimate during cold season could last 6 8 months.

Multi-Sensor Precipitation Estimation

MPE

- NCRFC Monitors and Mosaics 26 Radars.
 - Ises hourly DPA from WFO radars 4km grid.
 - Ises precipitation reports (DCP, MTR, etc.)
 That are defined in hourly network.
 - PA bias is applied to each radar based on nonzero radar bin / gage pairs for each hour.
- Produce hourly MAPX to then generate 6hour MAPX time series for river model.

Summary of MPE issues for NCRFC:

- Radar Coverage.
- Hourly Gage Network.
- Freezing/frozen precipitation bright banding.
- Detecting snow accurately

Some past problems that have recently been identified / fixed...

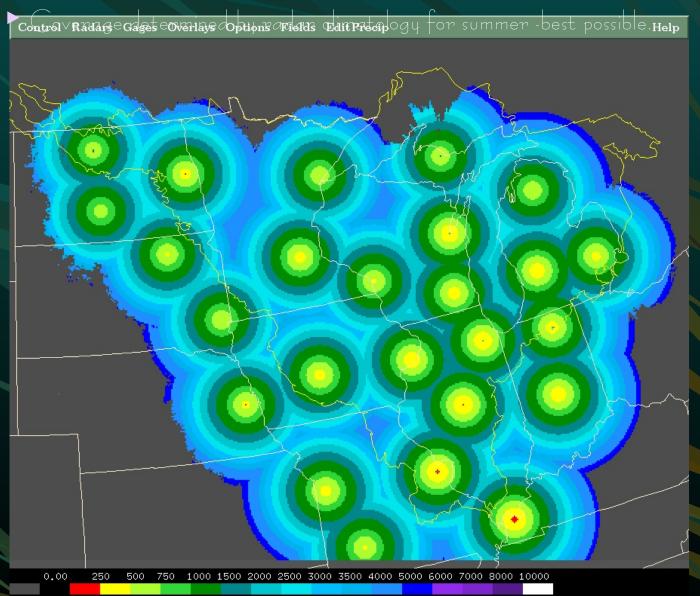
- Inder estimation especially due to that truncation problem.
- Inder estimation due to missing DPA's often during hours of significant weather and heavy rainfall at WFO's...(that was really irritating).
- We had a problem locally where a script related to 'decodedpa' was too restrictive in time allowances for dpa products.)

Radar coverage in Upper Midwest:

- Radar coverage is insufficient for several areas.
 - Many areas in northern part of this region have no true coverage during cold season.
 - Even during warm season there are gaps, and many areas are not within range of expecting good precipitation estimates -western

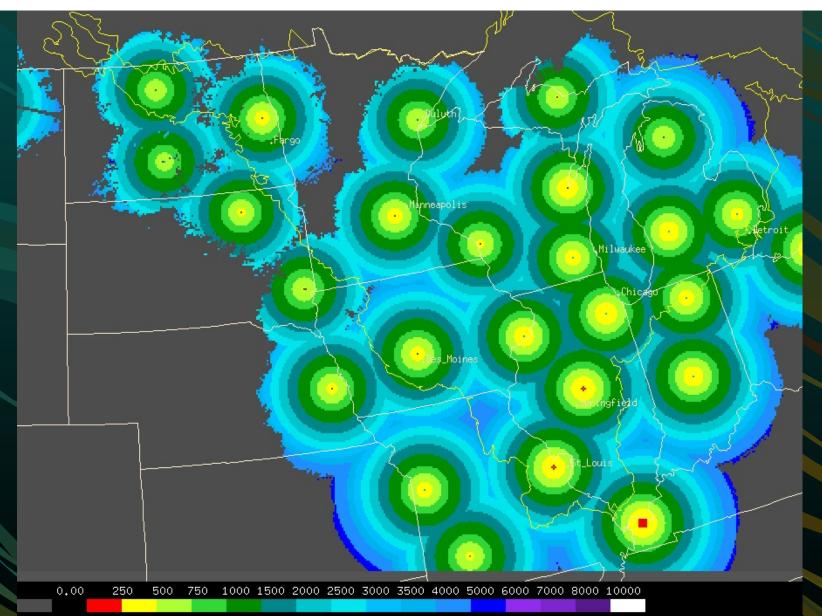
 Minnesota, northern lowa, northern Wisconsin.
 - We don't expect anything can be done about this...but needs to be mentioned..

Radar coverage map in NCRFC Region.



Nov1200114z rfc=ncrfc Height of Radar Coverage

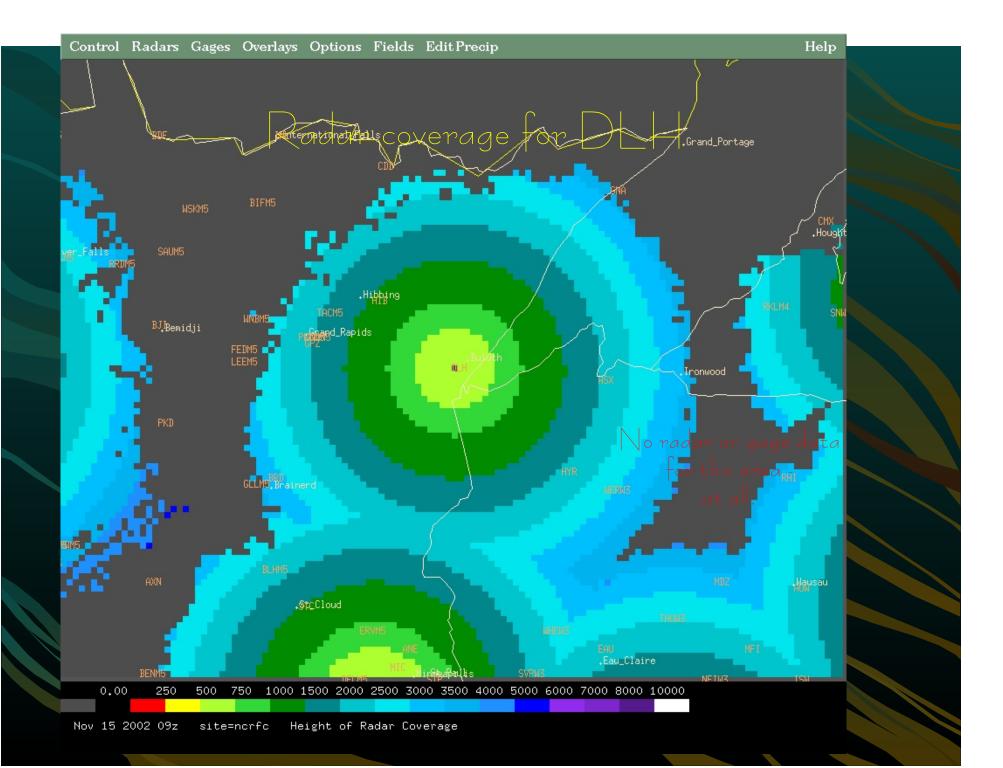
Current radar coverage using November Radar Climatologies.

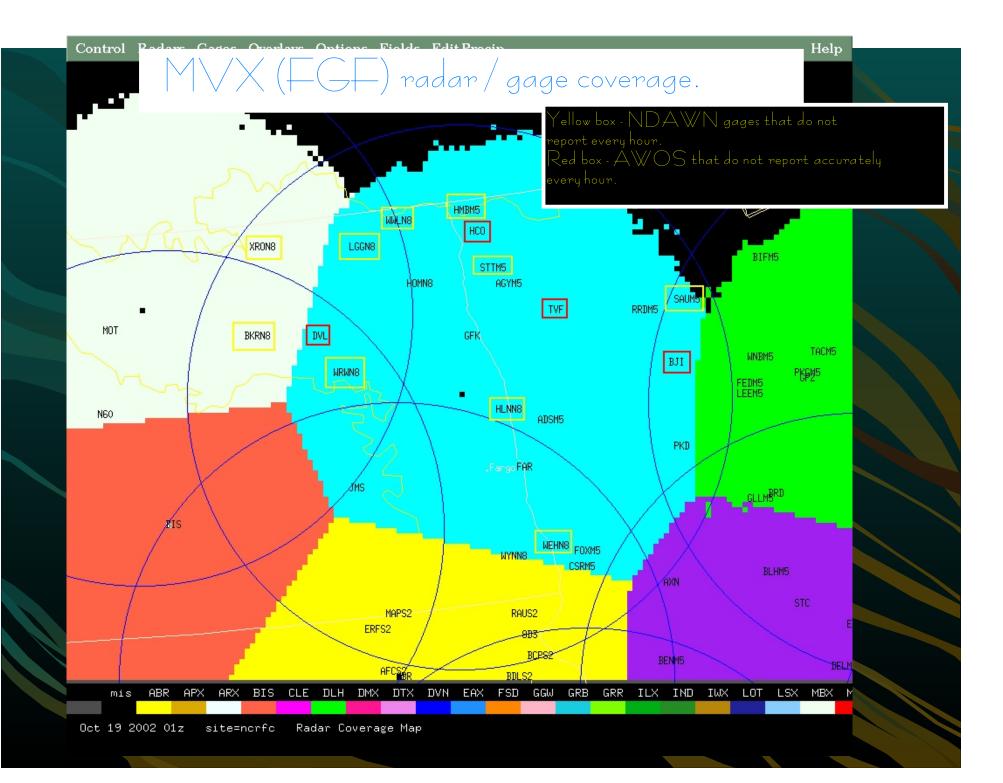


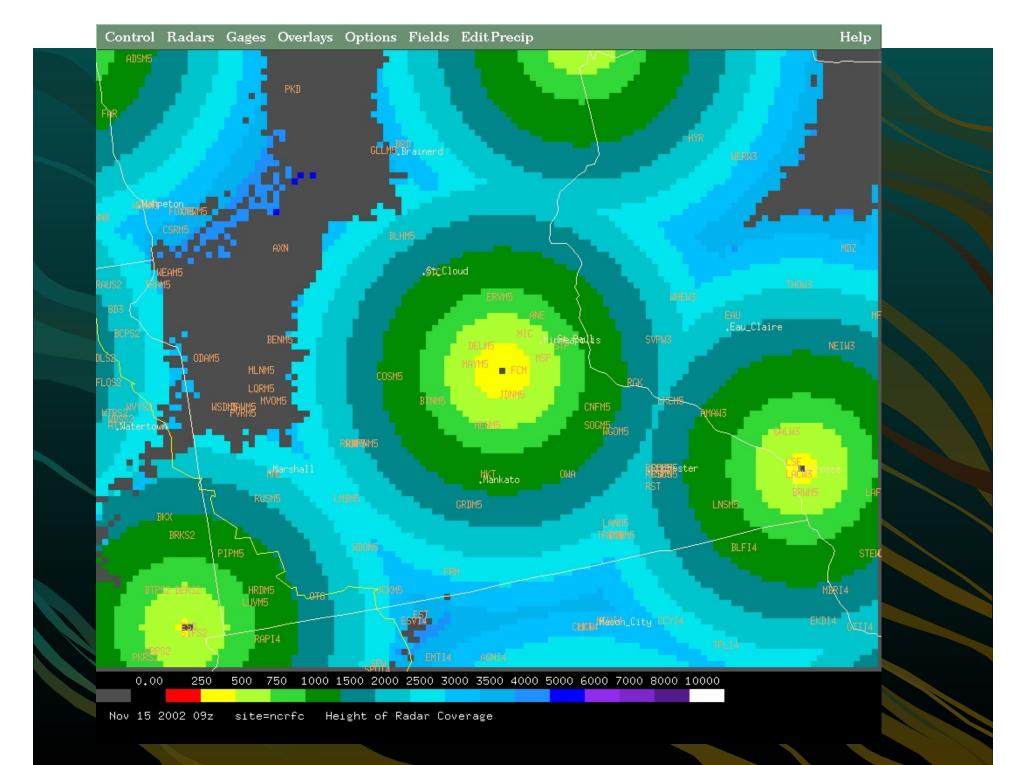
Nov 15 2002 01z site=ncrfc Height of Radar Coverage

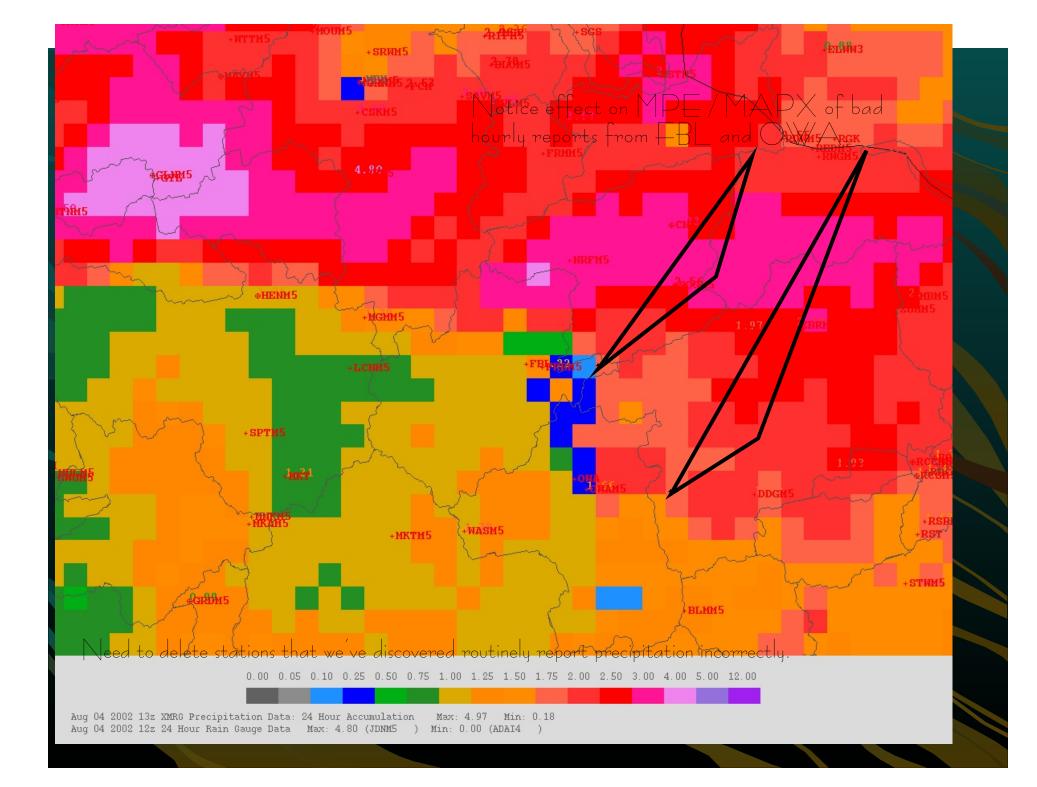
More MPE issues...the gages

- Gage network -
 - ► Many areas don't have enough gages.
 - Some areas need better distribution of gages.
 - ► Often gage data appears to degrade the estimates compared to the 'RMOSAIC'.
 - We often get best results using 'RMOSAIC' -especially for convection.
 - NCRFC is coordinating with WFO's to improve gage network (ie removing many gages, and perhaps developing 'seasonal networks.
 - QC is extremely time consuming, especially during freezing/frozen precip events -removing zeroes during snowfall and then removing false reports from melting snow in gages. BUT if we 'turn off' all unheated gages we won't have much to work with.





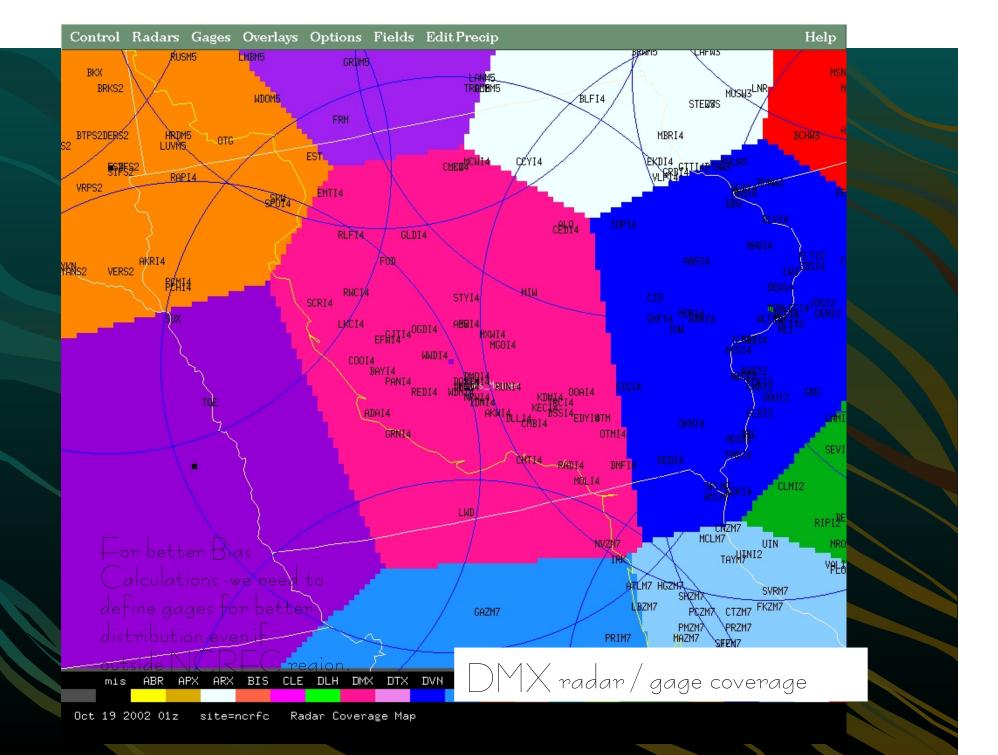


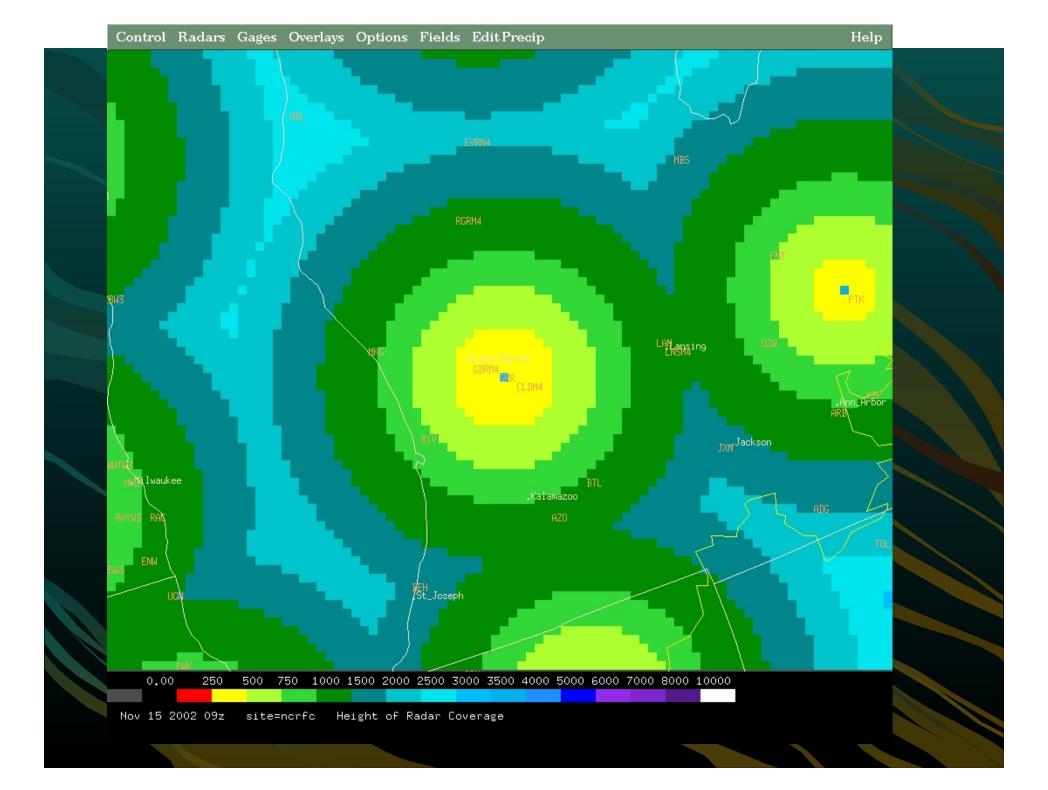


■24 hour OWA report was accurate ~ 1.78"

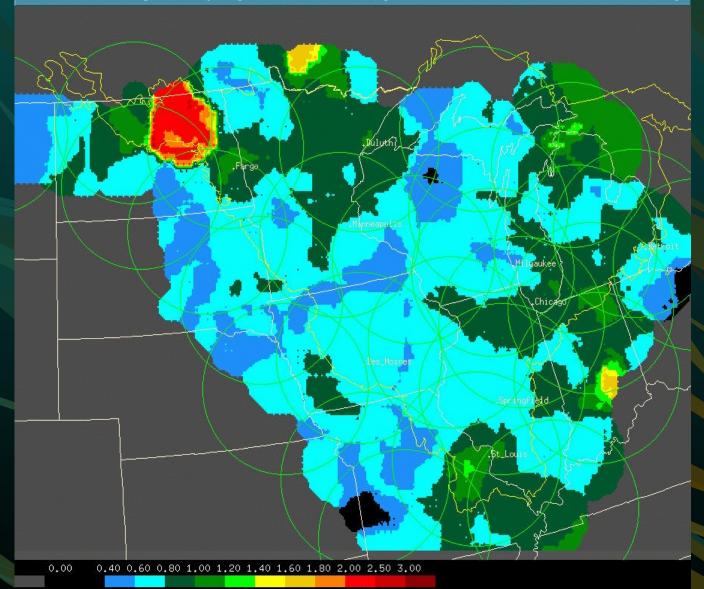
- BUT top of the hour reports are significantly lower.
 - Notice 0.03" at 02:38 and 0.72" at 02:58.
 - False Non-zero reports reduce bias accuracy

```
PP 1001 RZ Z 2002-08-04 05:58:00 MSPMTROWA
OWA
                                                      0.00
                                                             0.00
       PP 1006 RZ Z 2002-08-04 05:58:00 MSPMTROWA
                                                             0.00
OWA
                                                      0.00
OWA
       PP 1006 RZ Z 2002-08-04 05:38:00 MSPMTROWA
                                                      0.00
                                                             -0.01
OWA
       PP 1001 RZ Z 2002-08-04 05:38:00 MSPMTROWA
                                                      0.01
                                                             0.00
       PP 1001 RZ Z 2002-08-04 05:18:00 MSPMTROWA
                                                      0.01
OWA
                                                             0.01
                                                             -0.20
       PP 1001 RZ Z 2002-08-04 04:58:00 MSPMTROWA
                                                      0.00
OWA
OWA
       PP 1001 RZ Z 2002-08-04 04:40:00 MSPMTROWA
                                                      0.20
                                                             0.10
OWA
       PP 1001 RZ Z 2002-08-04 04:18:00 MSPMTROWA
                                                      0.10
                                                             0.08
OWA
       PP 1001 RZ Z 2002-08-04 03:58:00 MSPMTROWA
                                                      0.02
                                                             -0.12
       PP 1001 RZ Z 2002-08-04 03:38:00 MSPMTROWA
                                                      0.14
                                                             0.03
OWA
                                                      0.11
                                                             0.08
OWA
       PP 1001 RZ Z 2002-08-04 03:18:00 MSPMTROWA
OWA
       PP 1001 RZ Z 2002-08-04 02:58:00 MSPMTROWA
                                                      0.03
                                                             -0.69
       PP 1001 RZ Z 2002-08-04 02:38:00 MSPMTROWA
                                                      0.72
                                                             0.72
OWA
OWA
       PP 1001 RZ Z 2002-08-04 02:18:00 MSPMTROWA
                                                      0.00
                                                             0.00
       PP 1001 RZ Z 2002-08-04 02:04:00 MSPMTROWA
OWA
                                                      0.00
                                                             0.00
OWA
       PP 1001 RZ Z 2002-08-04 01:38:00 MSPMTROWA
                                                      0.00
                                                             0.00
       PP 1001 RZ Z 2002-08-04 01:18:00 MSPMTROWA
                                                      0.00
                                                             0.00
OWA
       PP 1001 RZ Z 2002-08-04 00:58:00 MSPMTROWA
                                                      0.00
                                                             0.00
OWA
OWA
       PP 1001 RZ Z 2002-08-04 00:38:00 MSPMTROWA
                                                      0.00
                                                             0.00
OWA
       PP 1001 RZ Z 2002-08-04 00:18:00 MSPMTROWA
                                                      0.00
                                                             0.00
       PP 1001 RZ Z 2002-08-03 23:58:00 MSPMTROWA
OWA
                                                      0.00
                                                             0.00
       PP 1006 RZ Z 2002-08-03 23:58:00 MSPMTROW A
OWA
                                                      0.00
                                                             0.00
```





Singentrol Radars Gages Overlays Options Fields Edit Precip Help



Aug 18 2002 07z site=ncrfc Local Bias Values

Using LMOSAIC with LocBias applied...

- The LocBias often appears `whacked out'.
- We don't have very much experience with this.
- We don't often use LMOSAIC, but wonder if with better gage QC this would be a better option at times than the BMOSAIC one bias applied over the entire radar field.
- BMOSAIC currently our Npairs Threshhold = 20. Should it be lower? It would be nice if different radars could have different threshholds.

_ast words about our gage network...

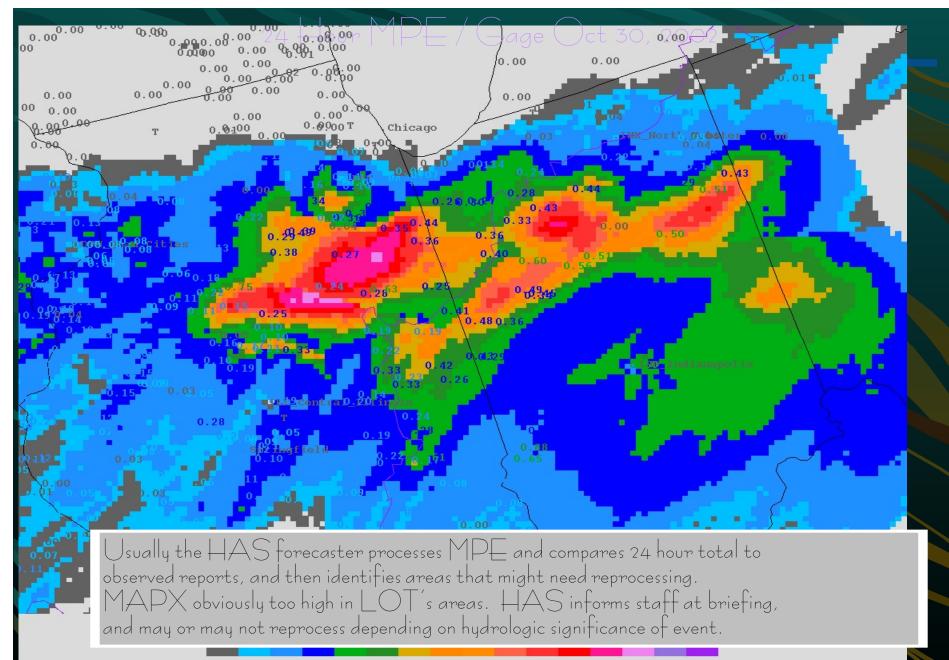
- Currently without extensive QC of gages it seems like they are not improving MPE...BUT
 - We are working on improving but hourly and 24 hour networks for MAP/MAPX.
 - hourly stations defined, with about 500-600 that might actually report any given day. And we have about 2200 24 hour sites defined, with about 1000 that might actually report on any given day.
 - ► (We do have stations defined now that shouldn't be.)
 - MHEN we get the network in order we feel our BIAS Calculations will improve tremendously.
 - ► COOP Modernization?.....

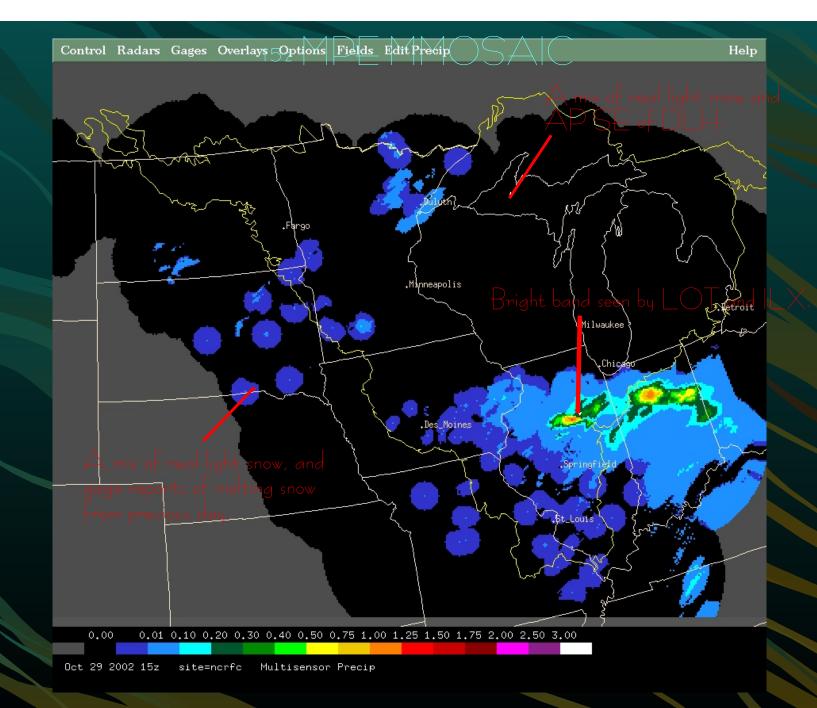
MPE issues.....Bright banding...

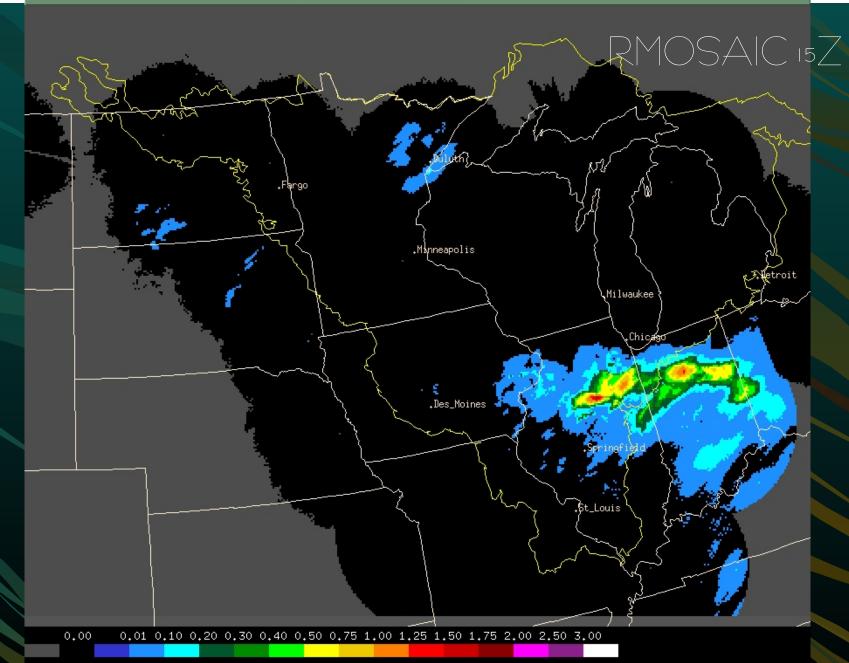
- Bright banding impacts MPE in the NCRFC region routinely November to April...and often in October and May. (So that's a lot of the time).
- If we need to correct for bright banding (or hail contamination) we cannot edit/draw polygons while zoomed, which is a significant problem for an area as big as ours.
 - It appears that MPE for WFO's (hmap?) Will have the ability to edit/draw while zoomed...more on 'hmap' later.
- There is no easy tool to identify freezing level for each radar.
 - t would be really nice to have some sort of product of mosaicked WFO freezing levels.

Bright banding (continued...)

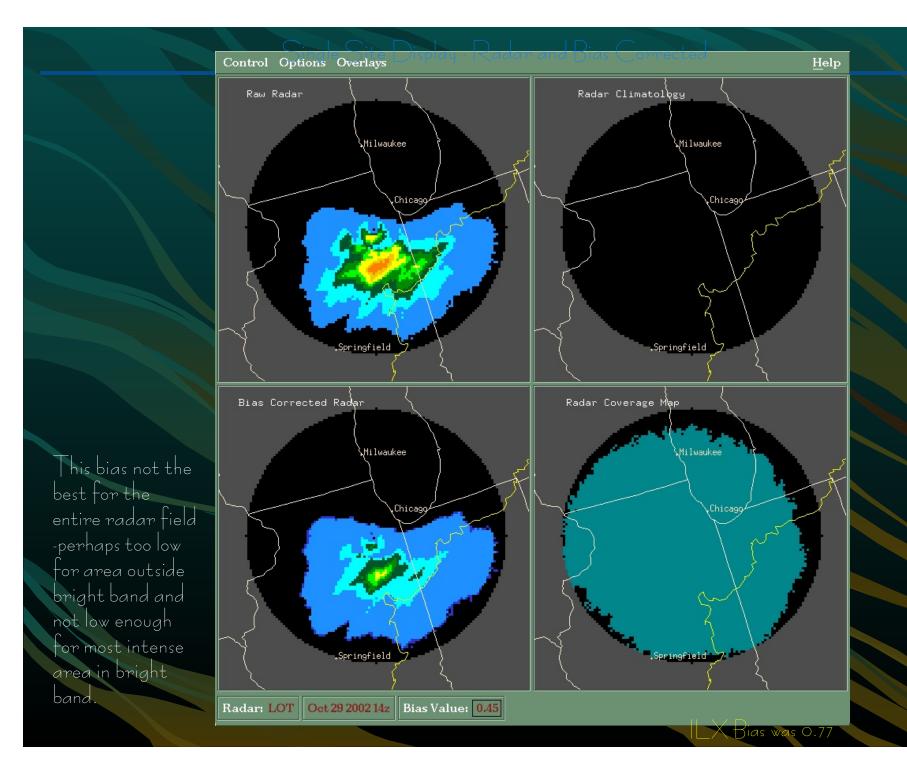
- We probably need more/better training here for HAS shift workers to identify and QC bright banding.
- Bright banding is evident in the 24 hour total MPE (xmrg), but not so visible as the HAS is processing each individual hour.
 - It would be really nice to see a 24 hour picture of the RMOSAIC with no bias or gage data so the HAS forecaster could identify problem areas before processing each hour.
 - Does this possibility exist, but we just don't know about it?

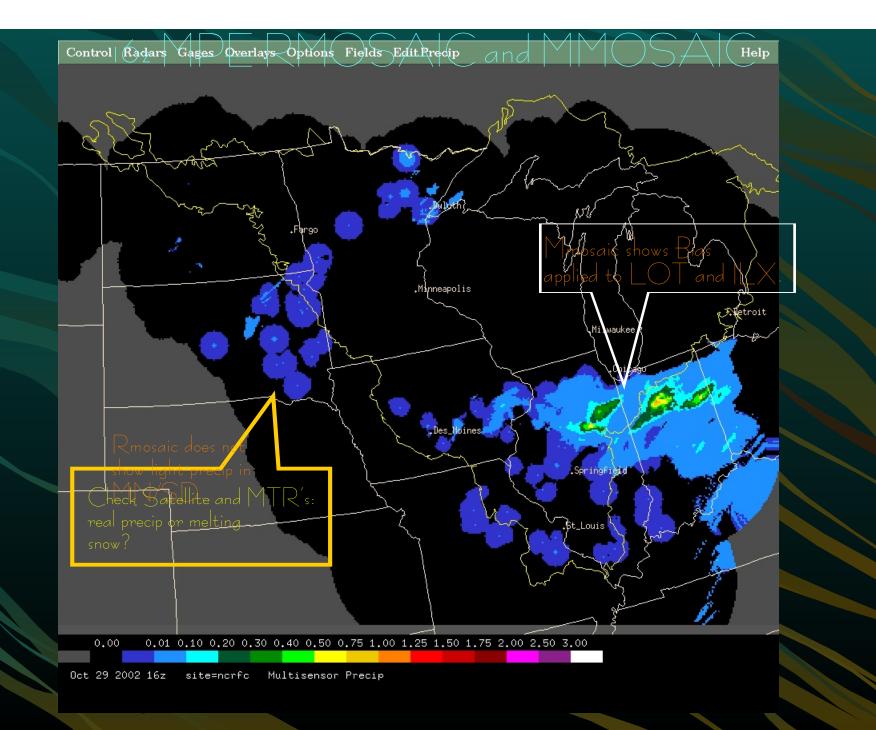




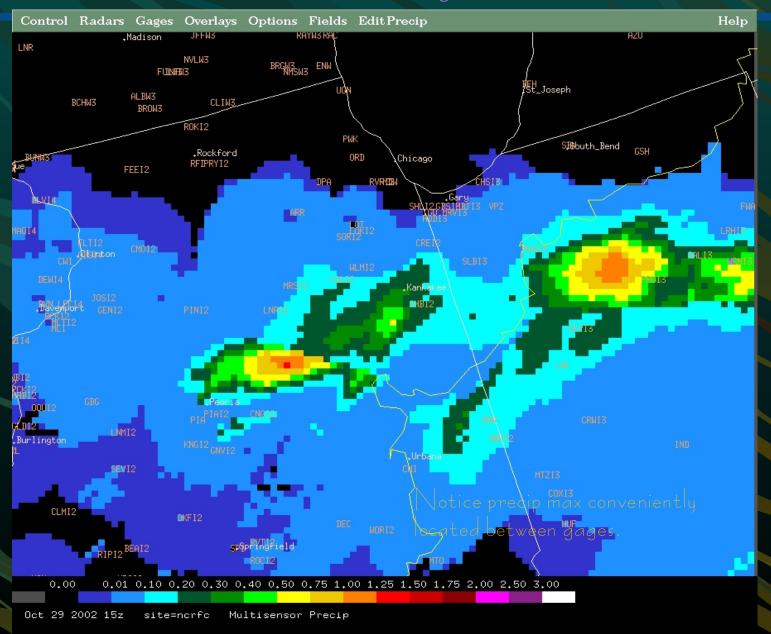


Oct 29 2002 15z site=ncrfc Radar-Derived Precip



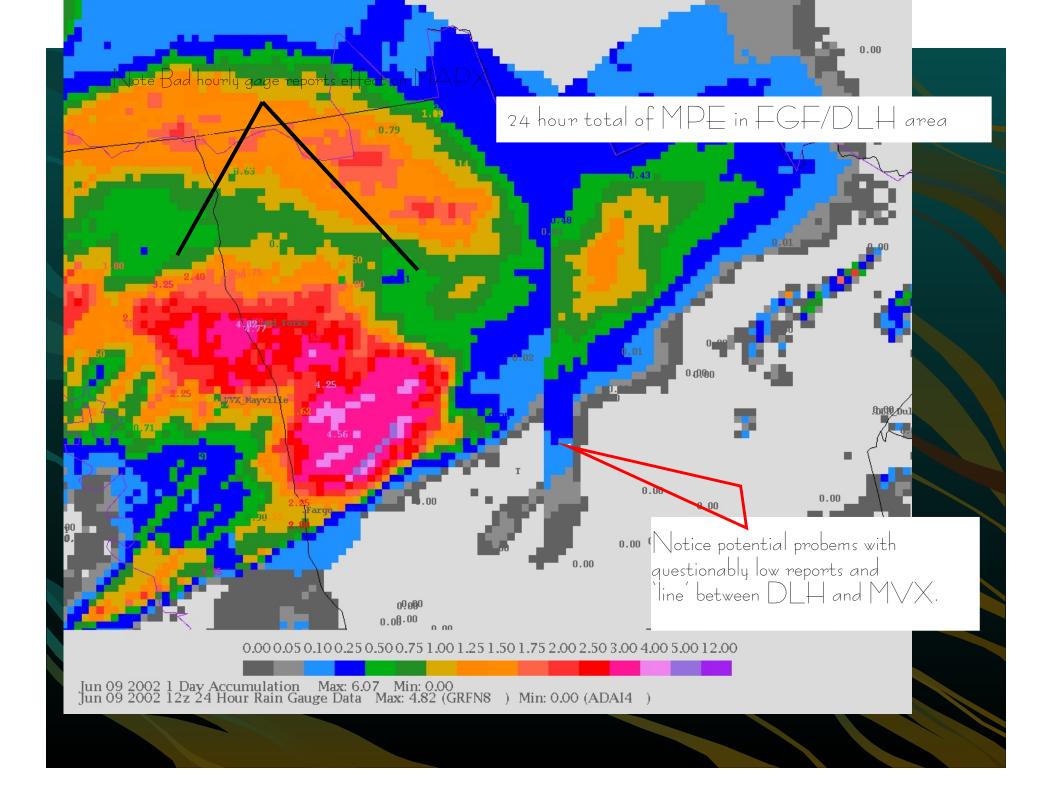


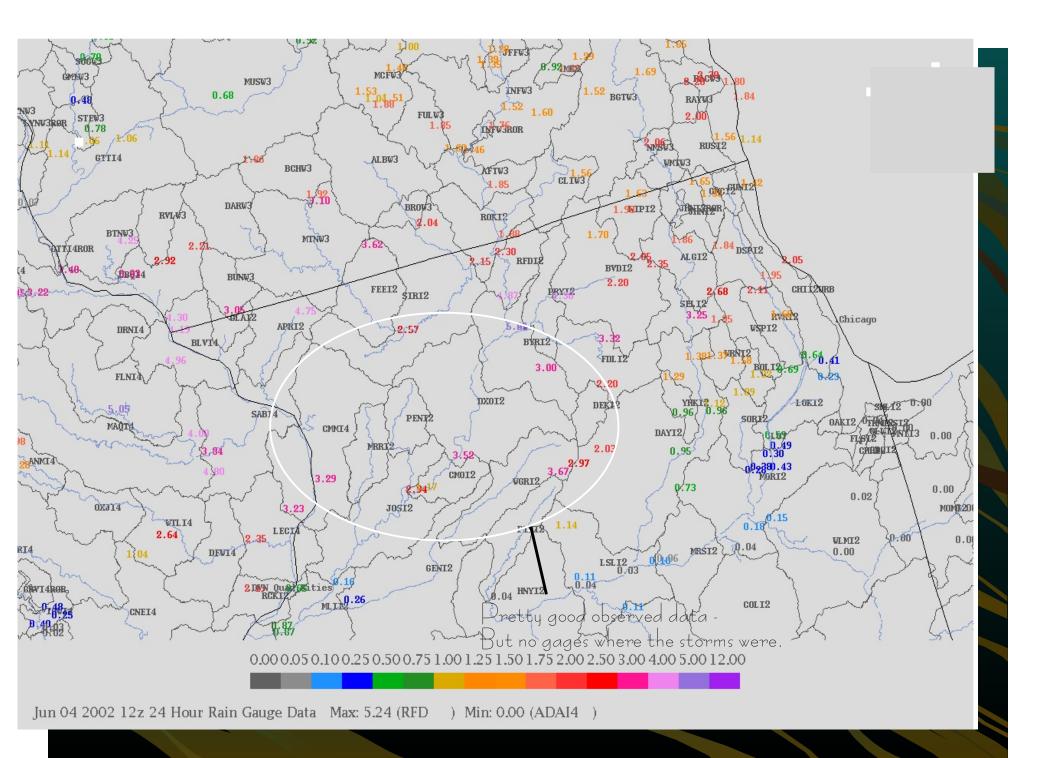
15z Zoom Gage D's

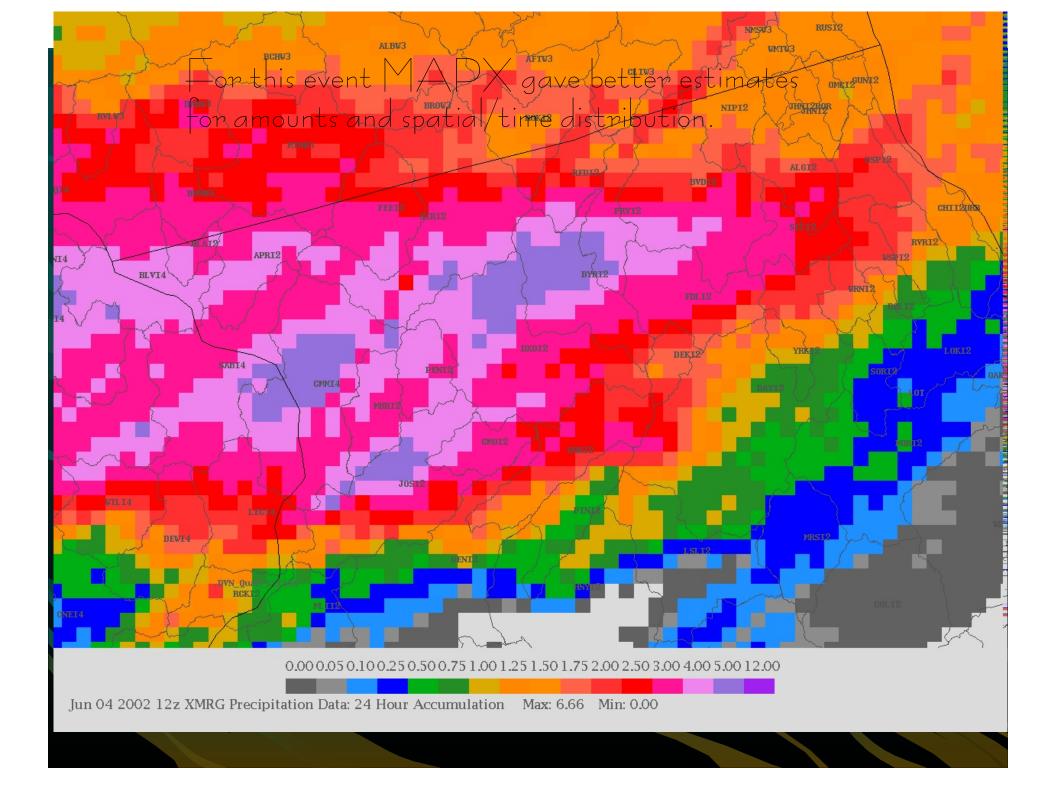


Some examples of MPE/MAPX... That we did use in the model.

- Sometimes even if radar is underestimating it is better than observed data in data sparse areas.
- Sometimes even with good data MPE is better for space/time distribution.







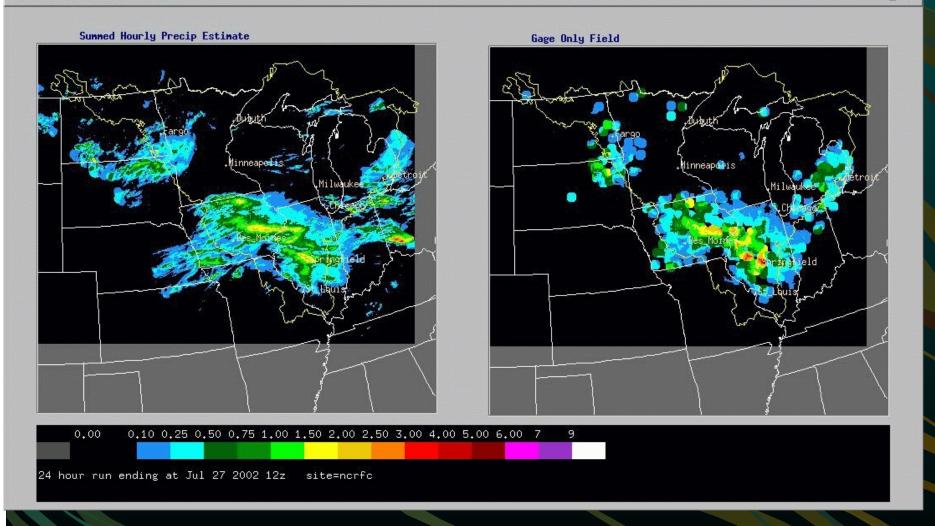
MPE issues...detecting snow

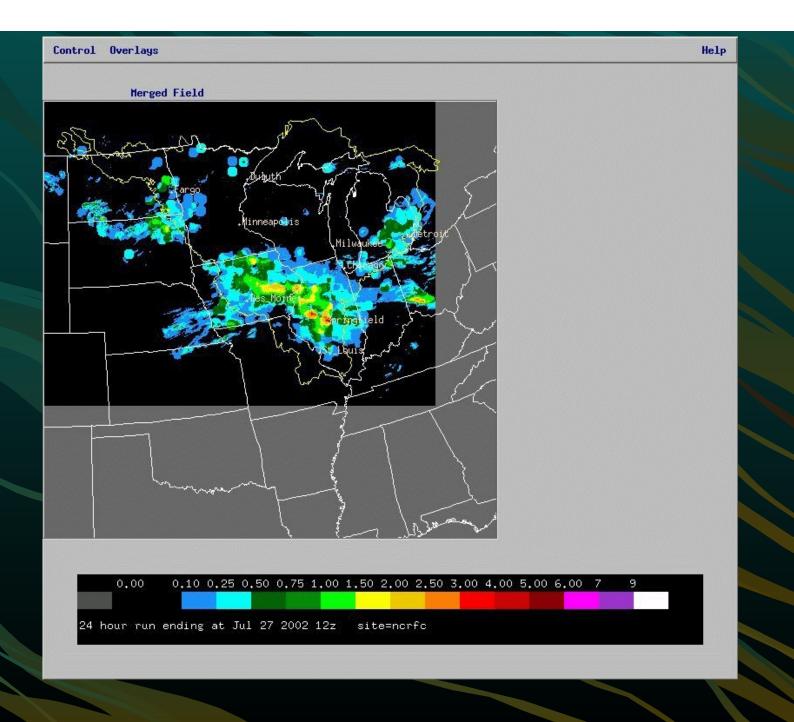
- Basically we don't rely very much on radar for water equivalent of snowfall across the region...just not reliable enough...yet.
- MPX indicates snow algorithm shows improvement.
- NCRFC would like to know if we can tell when/if snow algorithm is used, by which WFOs.
- In MPE...will the Z-S Relationship show up when we `Display Bias Table'?

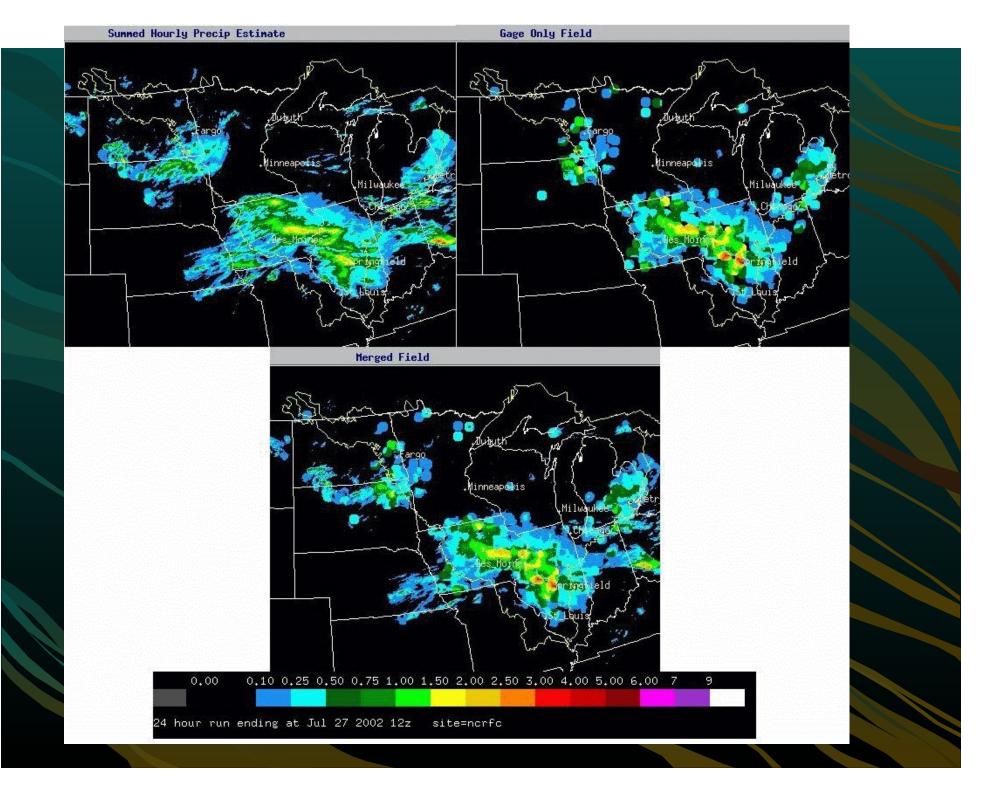
MPE Post Analysis

- We don't use it very much...we are more likely to reprocess hourly MPE to get better results...then we don't have time for post analysis...and it coredumps alot.
- Size and resolution make it very difficult to analyze data...and we often get coredumps when zooming.
- here does not appear a way to overlay gage reports on the merged fields to check if you like the results.
- Maybe the results aren't so great because of the gage networks and need for better QC?
- Does not currently run on _inux.

Control Options Overlays







What's happening in the future?

- What's the deal with WFO's using MPE?
- What's the plan for coordination of MPE between WFO's and RFC's?
 - ► Bias corrections, gage networks, any QC that might be done by WFO's?
- What are the new tools going to be..."hmap"?
- Are the RFC's going to lose the functionality of the current MPE and have to use this new version....?

Things | have problem with in 'hmap'...

May or may not be a problem for WFO's, but are certainly a problem for the RFC IF this is going to be the MPE of the future.

- It takes a long time to process at least 3 minutes to bring up and a long pause for every operation. It's toooo slow.
- The initial view is cluttered with a pile of unreadable points and labels and rivers and streams very inefficient to have to turn this off every time we run HMAP_MPE.
- The Zoom function extremely cumbersome compared to MPE
- When you call up a single Radar site the radar umbrella is filled with D's which you have to turn off in order to see anything.
- There is a inconsistency in buttons/toggles, etc.
- To edit a gage you have to first 'display 7X7 grid' and then zoom and then display gage values and TRY to edit but it coredumps every time. And you have to go through ALL of that every single time you want to edit a gage.

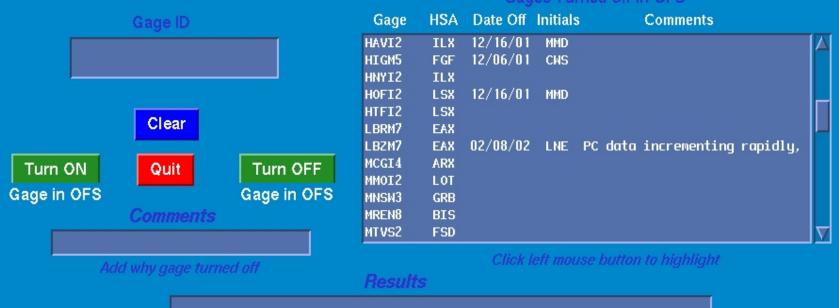
NCRFC Observed Precipitation Network

- Precipitation Network is periodically updated in coordination with WFO as stations are defined or deleted.
 - only stations defined in the precipitation network are used in MAD.
- Most accurate MAP for river model input.
 - ► COP Network Reports

 - MTR's AWOS/ASOS

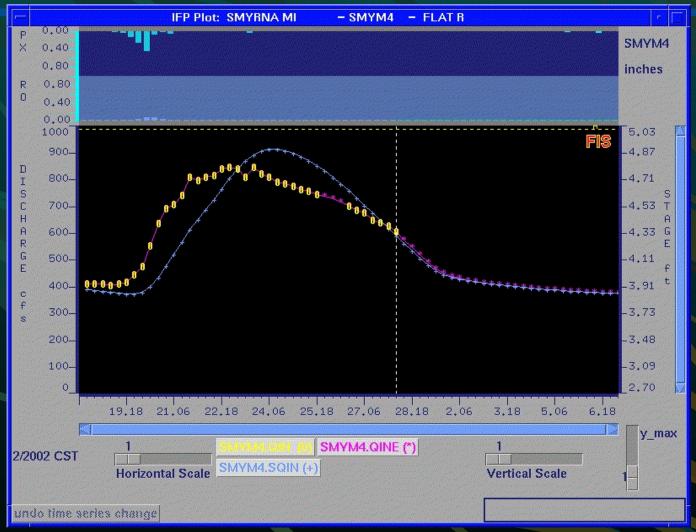
Monitoring Sites in Precipitation Network...

- Stations with 'questionable' reporting history may be 'turned off' in OFS.
- We will be coordinating with WFO's for assistance in determining when gages should not on off the off in OFS

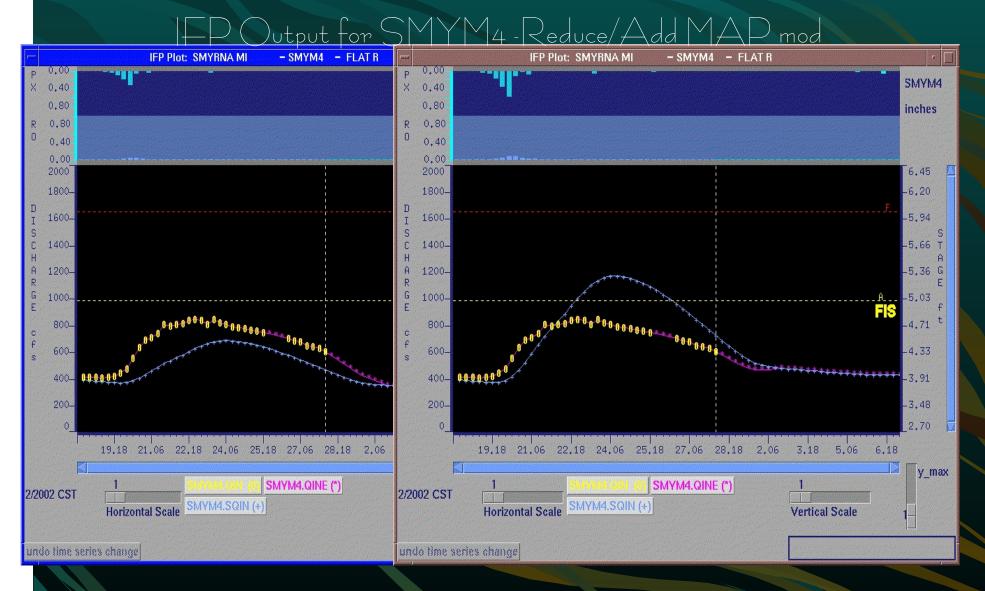


Turn Precipitation Gages OFF and ON in OFS Database

IPP output for SMYM4



No modifications applied to this hydrograph for precip event 0219-0221.



MAP increased by 30% - over simulation.

Some ideas for improving MAP/MAPX...

- Need coordinated effort between WFOs and RFC to keep gage network up to date.
- Need to identify 'holes' in network where gages are most needed...for best distribution of stations.
- Wherever possible get daily precipitation reports.
- More training for RFCHAS shift workers and more effort to study/improve MAPX even if it seems 'not hydrologically significant.'
- Better coordination betweeen WFOs and RFCs on radar precipitation estimates.
- Better understanding of importance of all reports for river forecasting...as it affects river flood forecasts and flash flood guidance and meteorological models.

To sum up....

- Radar/MPE Precipitation estimates can be useful for RFC's, but the NCRFC we can only use them case by case as determined by HAS forecasters and hydrologists.
 - n some areas it's great, others not so good.
- The Observed Automated and COOP networks are still the most important precipitation estimates for us...and a basically the only estimate for us in Winter.
- But we really do need both.

The summing up (continued)

It's difficult to separate the processing tools from the precipitation estimates derived by radar algorithms...so even if the radar derived estimates are fabulous, if we at the RFC can't process and QC the data with efficiency and confidence that we are producing reliable results...well then what is the point?